CLAIMS

What is claimed is:

1. An interconnect assembly comprising:

a substrate;

a contact element disposed on said substrate, a first portion of said contact element adapted to be free-standing and further adapted to be capable of moving from a first position to a second position when a force is applied to said first portion of said contact element; and

a stop structure disposed on a second portion of said contact element, said stop structure defining said second position.

2. The interconnect assembly as in claim 1, wherein a plurality of said contact elements are disposed on said substrate, said contact elements disposed in a pitch having a range of about 2.5 microns to 2000 microns.

3. The interconnect assembly as in claim 1, wherein said substrate has a bond pad connected to a microelectronic device, said contact element disposed on said bond pad.

4. The interconnect assembly as in claim 1, wherein said substrate has a re-distributed conductor connected to a microelectronic device, said contact element disposed on said re-distributed conductor.

5. The interconnect assembly as in claim 1, wherein said substrate has a bond pad connected to a test equipment, said contact element disposed on said bond pad.

6. The interconnect assembly as in claim 1, wherein said contact element is resilient and wherein said stop structure presses against said second portion with said force when said force is applied to said first portion.

7. The interconnect assembly as in claim 1, wherein said contact element comprises at least one metal layer.

8. The interconnect assembly as in claim 1, wherein said contact element comprises a first metal layer and a second metal layer, said first metal layer providing said contact element with resiliency and said second metal layer providing electrical conductivity for said contact element.

9. The interconnect assembly as in claim 1, wherein said contact element is an elongate resilient contact element.

10. The interconnect assembly as in claim 1, wherein said first portion of said contact element is sloped relative to a surface of said substrate such that one end of said first portion of said contact element is at a height above said surface of said substrate.

11. The interconnect assembly as in claim 1, wherein a portion of said first portion of said contact element protrudes at a height from a surface of said stop structure.

12. The interconnect assembly as in claim 11, wherein said height in which said contact element protrudes from said surface of said stop structure is a predetermined height.

13. The interconnect assembly as in claim 1, wherein said substrate comprises an integrated circuit in a semiconductor material, and wherein said force is applied when another contact element is brought into mechanical and electrical contact with said contact element.

14. The interconnect assembly as in claim 1, wherein said contact element is a resilient contact element and wherein said force is applied when another contact element is brought into mechanical and electrical contact with said contact element and wherein said force causes said resilient contact element to flex from said first position to said second position and wherein said stop structure defines said second position which defines a maximum flexing of said resilient contact element.

15. The interconnect assembly as in claim 1, wherein said first portion of said contact element has substantially a triangular shape and a third portion of said contact element being a point of said triangular shape.

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16. The interconnect assembly as in claim 1, wherein said stop structure has a vertical height that is less than a vertical height of a shortest contact element that is statistically likely to exist.

17. A method of forming an interconnect assembly, said method comprising:

disposing a contact element on a substrate, a first portion of said contact element being free-standing and being capable of moving from a first position to a second position when a force is applied to said first portion of said contact element; and

disposing a stop structure on a second portion of said contact element, said stop structure defining said second position.

18. The method as in claim 17, wherein disposing said contact element on said substrate includes disposing another contact element on said substrate in a fine pitch.

19. The method as in claim 17, wherein said contact element is free-standing and resilient.

20. The method as in claim 17, wherein disposing said contact element further comprises:

applying a first masking layer on said substrate;

forming in said first masking layer, an opening extending into said first masking layer, said opening having a tapered wall; and

depositing a metal layer on said tapered wall of said opening of said first masking layer.

21. The method as in claim 20, wherein said tapered wall is tapered using at least one technique of tapering by using a gradual scale, tapering by reflowing, tapering by controlled exposure, tapering by varying a mask distance or tapering by multiple exposures.

22. The method as in claim 20, wherein after forming said tapered wall, the method further comprises:

placing a mask pattern over said first masking layer, said mask pattern having a pattern substantially triangular in shape; and

depositing said metal layer in said opening of said first masking layer in said substantially triangular shape according to said mask pattern.

23. The method as in claim 20, wherein depositing said metal layer includes using one of a sputtering deposition process, an electroplating process, a chemical vapor deposition process and an electroless plating process.

24. The method as in claim 20, wherein depositing said metal layer includes:

depositing a first metal layer, said first metal layer selected for its resilient property; and

depositing a second metal layer, said second metal layer selected for its electrical conducting property.

25. The method as in claim 20, further comprising:

removing a portion of said first masking layer as to allow said contact element to be free-standing; and

applying an additional layer as to cover said second portion of said contact element.

26. The method as in claim 25, further comprising:

planarizing said first masking layer to form said stop structure, said stop structure having a vertical height less than a vertical height of a shortest contact element that exists.

27. The method as in claim 20, further comprising:

removing said first masking layer;

applying a second layer over said second portion of said contact element and allowing said first portion of said contact element to be free-standing.

28. The method as in claim 27, further comprising:

planarizing said second layer to form said stop structure, said stop structure having a vertical height less than a vertical height of a shortest contact element.

29. The method as in claim 17, wherein said contact element is a resilient contact element which is free-standing and wherein said force is applied when another contact element is brought into mechanical and electrical contact with said contact element and wherein said force causes said resilient contact element to flex from said first position to said second position and wherein said stop structure defines said second position which defines a maximum flexing of said resilient contact element.

30. The method as in claim 17, wherein said contact element is a resilient contact element which is free-standing and wherein said stop structure presses against said second portion with said force when said force is applied to said first portion and wherein said force is applied when another contact element is brought into mechanical and electrical contact with said contact element.

31. An electrical system comprising:

a first substrate having a first contact element;

a second substrate;

at least one second contact element disposed on said second substrate, a first portion of said second contact element adapted to be free-standing and further adapted to be capable of moving from a first position to a

second position when a force is applied to said first portion of said second contact element by said first contact element; and

a stop structure disposed on a second portion of said second contact element, said stop structure defining said second position.

32. The electrical system as in claim 31, wherein said second substrate has a bond pad connected to a microelectronic device, said second portion of said second contact element disposed on said bond pad, and said first substrate is one of (1) a test probe assembly having said first contact element to make contact with said second contact element and (2) a package having said first contact element to house said microelectronic device during use of said microelectronic device.

33. A method for forming a freestanding, elongate resilient contact element, said method comprising:

depressing a mold into a deformable material, said mold determining a shape of at least a portion of said freestanding, elongate resilient contact element;

forming at least said portion of said freestanding, elongate resilient contact element on said deformable material.

34. A method as in claim 33 wherein said forming comprises depositing a conductive material on said deformable material after said deformable material has been deformed with said mold.

35. A method as in claim 34 wherein said mold comprises a plurality of shapes for a corresponding plurality of portions of freestanding, elongate resilient contact elements.

36. A method as in claim 35 further comprising:

removing said deformable material after depositing said conductive material.

37. A method as in claim 36 wherein said freestanding, elongate resilient elements are disposed on corresponding electrical interconnect pads on a substrate.

38. A method as in claim 37 wherein said substrate comprises a semiconductor integrated circuit.

39. A lithographically formed resilient contact element having a curved beam portion which extends upwardly from a substrate and which is lithographically defined.

40. A lithographically formed resilient contact element as in claim 39 further comprising:

a base portion attached mechanically to said substrate and electrically coupled to an electrical interconnection terminal on said substrate, and wherein

said resilient contact element is freestanding when released after being initially formed.

41. A lithographically defined resilient contact element as in claim 40 wherein a curve of said curved beam portion extends upwardly away from said substrate and said curve is lithographically defined by a curved slope in a sacrificial layer which is removed to release said resilient contact element.

42. A lithographically defined resilient contact element as in claim 40 further comprising a sacrificial layer which defines a curve of said curved beam portion.

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